WHAT IS CLAIMED IS:

1. A microchannel sample-handling apparatus for processing a sample, comprising

(a) a microchannel device having

(i) a substrate,

(ii) an elongate or planar multisite reaction channel formed in said substrate for receiving a bulk-phase medium containing sample components, said reaction channel having a plurality of reaction regions and region-specific reagents associated with each region, for simultaneously conducted different reactions on sample components within the reaction channel,

(iii) one or more sample-preparation stations in said substrate, upstream of said reaction channel, for carrying out one or more selected sample-preparation steps effective to convert a sample to such bulk-phase medium, and

(iv) one or more product-processing stations downstream of said reaction channel, for processing products generated in one or more of said reaction regions,

means for transferring solvent or solvent components between one of said sample-preparation stations and one or more selected reaction regions in the reaction channel, and between one or more selected reaction regions in the reaction channel and one of said product-processing stations, and

a control unit for activating said transfer means, to effect transfer, in a selected reaction region, of solvent or solvent components from or to each hold or region-specific reservoir, to or from the associated reaction region.

2. The apparatus of claim 1, which further includes a second reaction chamber for receiving a second bulk-phase medium containing sample components, said second reaction channel having a plurality of reaction regions and region-specific reagents associated with each region, for simultaneously conducting different reactions on sample components within the reaction channel.

3. The apparatus of claim 2, wherein the reaction regions in the first-mentioned reaction channel are operatively connected to associated reaction regions in the second reaction channel via gated side channels, and said control means is operative to transfer reaction components directly between associated reaction regions in the two reaction channels.

4. The apparatus of claim 2, wherein reaction regions in the first-mentioned reaction channel are operatively connected to reaction regions in the second reaction channel via a common hold reservoir which receives sample components from reaction regions in one reaction channel, and supplies the combined components to reaction regions in the other reaction channel.

5. The apparatus of claim 2, wherein the two reaction chambers are formed in different layers of the device, and reaction regions in the two channels are interconnected by side channels extending between the two layers.

6. The apparatus of claim 5, wherein at least one of the two reaction channels include capillary-tube ports adapted to receive a capillary tube therein, for supplying or removing a selected reagent or component to or from that port.

7. The apparatus of claim 1, wherein at least some of said stations and the reaction channel include capillary-tube ports adapted to receive a capillary tube therein, for supplying or removing a selected reagent or component to or from that port.

8. The apparatus of claim 1, wherein said sample-preparation stations include at least one of a cell-culture station, a station at which cells grown in the cell-culture station are lysed, and a reservoir containing lysing medium.

9. The apparatus of claim 1, wherein said product-processing stations include a station selected from the group consisting of:

(a) a waste reservoir for receiving selected components from the reaction regions;

(b) a capture station at which selected components from the reaction channel are captured and concentrated;

(c) an assay-reagent reservoir from which assay components are added to sample components;

(d) an assay station from which assay components are added to sample components;

(e) a separation channel at which sample components can be separated; and

(e) a second multisite reaction channel.

10. The apparatus of claim 9, wherein which further includes a detector for detecting the presence of absence of selected components contained in selected reaction regions, and the control unit is operable to move selected reaction components to other stations in the device, based on the presence of absence of such detected components.

11. The apparatus of claim 5, wherein the two layers are detachable reaction modules, allowing one module to be replaced by another during a sample-processing operation, where the two modules include alignable fluid-transfer channels and alignment structure for placing the modules in an aligned condition, allowing fluid transfer across the aligned channels.

12. A method of analyzing components in a sample, comprising

applying the sample to the microchannel device in the apparatus of claim 1,

operating the apparatus to process the sample, forming a bulk-phase medium containing sample components,

operating the apparatus to transfer the bulk phase medium into the multisite reaction channel in the apparatus, under conditions that promote simultaneous reactions with sample components and region-specific reagents in the channel,

operating the device to transfer one or more reacted components from the reaction channel into a processing station, to achieve at least one of the following results:

(a) removal of one or more reacted components produced in the reaction channel;

(b) assay of one or more reacted components produced in the reaction channel;

(c) further reaction of one or more reacted components produced in the reaction channel,

(d) mixing of two or more selected components contained or produced in the reaction channel;

(e) transfer of one or more selected components produced in the reaction channel to selected reaction region(s) in a second multisite reaction channel.in the device;

(f) separation of components contained in the reaction channel, or produced subsequently in the device, a separation medium; and

(g) detection of components contained in the reaction channel, or produced subsequently in the device, by a detector in the device.

13. The method of claim 12, wherein said operating includes assaying one or more components produced in selected regions of the reaction channel; and based on the results of said assaying, transferring selected components to another station in the device.

14. The method of claim 12, which includes transferring reaction components from one or more regions in one reaction channel to one or more regions in a second reaction channel in the apparatus.